

**REPORT OF THE ACOUSTIC SURVEY PELACUS 0399:
RESULTS ON SARDINE, MACKEREL,
HORSE MACKEREL AND ANCHOVY**

By

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1. INTRODUCTION

Following the recommendations of the Planning Group for Pelagic Acoustic Surveys in ICES Sub-Areas VIII and IX (ICES CM 1999/G:8). As well as the Spanish Atlantic waters (from the Miño river to Bidasoa), three work areas were identified in the southern part of the French continental shelf:

- a) The southernmost area
- b) The Gironde area
- c) The "Fer à Cheval" area

These areas were chosen according to the French experience in this area. Finally as in previous years, the survey was conducted on board R/V Thalassa along March. In addition, this survey was coordinated with that of ichthyoplankton performed by R/V Cornide de Saavedra. The main objective for this survey was to assess the SSB of sardine.

2. MATERIAL AND METHODS

Survey design and data analysis agreed with the recommendations adopted in the Planning Group. Survey grid consisted in a parallel track with random start with 8 nmi between transects, steamed at daytime at ship speed of 10 knots. (Figure 1).

Acoustic equipment consisted in a Simrad EK-500 echosounder echo-integrator with a split beam transducer working at 38 kHz. Main settings of the echosounder were controlled with a PC and echograms were stored using Echoview and Movies + packages.

Fishing stations for biological, fish echo-traces identification and echo-integrated energy allocation purposes were done either by the R/V and a chartered purse seine.

Echo integrated energy was allocated into fish species using two methods:

- a) According to known echo-traces

- b) According to the fish and length proportions found at the fishing station weighted by a Target Strength/Length relationship as proposed in the Planning Group.

In addition, 125 hydrography stations (CTD casts stations) were distributed along the surveyed area and continuous records of SSS and SST were collected as well as the main atmospheric conditions (i.e. wind -strength and direction-, pressure, etc).

3. RESULTS

Contrary to previous years, this year the French area was firstly covered.

3.1 Hydrology

First days were characterised for a deep Low Pressure (N-E winds reaching force 9-10). In the Spanish area, N and NE were also predominant with a mean strength of force 4-5 being only noticeable few days with south winds in the middle of the survey. Neither upwelling nor fronts were detected in the covered area. In such conditions, retention phenomena were predominant. (figures 2, 3 and 4)

3.2 Sardine

Figure 5 shows the allocated echo integrated energy by nmi as well as the distribution area. As in previous years, in the Spanish area only a few nmi were positives. Even in the inner part of the Bay of Biscay sardine was scarce and located close to the coast. On the contrary, in the French shelf sardine shown a spatial continuity, reaching its highest values in the "Fer à Cheval" area as expected.

Table 1 shows the input values for each zone and main results for ICES Subdivisions whereas table 2 disaggregates these results by age groups and figure 6 relative abundance by age group and zone. Younger fish (i.e. age group 1) was predominant in the western part of the Spanish area (IXa-N and VIIIc-w) and France (VIIIb), whereas in VIIIc-e the proportion of this age group is lower. Total biomass was estimated to be 43 thousand tonnes (726 million fish) in the Spanish area and 126 thousand tonnes (2544 million fish) in the French area. From 1998 to 1999 biomass in Spain increased from 35 to 43 thousand tonnes, but the number of fish remained almost similar because this year fish were older (higher) than the previous year.

3.3 Mackerel

Figure 7 shows the allocated echo integrated energy by nmi as well as the distribution area for mackerel. No mackerel was found in IXa-N and the bulk of the distribution was located in the Bay of Biscay. Table 3 shows the input values for each zone and the main results and table 4 and figure 8 show the estimated abundance by age group and area . Age groups 2 and 3 were the most abundant. Age group 1 was also abundant in the westernmost area and in France.

Total abundance was estimated to be 283 thousand tonnes (985 million fish) in the Spanish area and 254 thousand tonnes (1129 million fish) in France.

3.4 Horse Mackerel

Figure 9 shows the distribution area of horse mackerel and tables 5 and 6 the input data and the results by age groups and area. In addition, figure 10 shows the relative abundance by age group and area.

As mackerel, scad was distributed throughout the continental shelf. Nevertheless, a few patches were also found in IXa. The youngest were located close to the coast, mainly over peaks. As it was already seen in sardine and mackerel the youngest were mainly located in the westernmost area (IXa-N and VIIIc-W) and France whereas the adults area predominant in the Cantabrian waters.

Total abundance was estimated to be 93 thousand tonnes (698 millions fish) in Spain and 51 thousand tonnes (1146 millions fish) in France.

3.5 Anchovy

Figure 11 shows the distribution area of anchovy. It was concentrated in France. In Spain only a few schools were detected in the inner part of the Bay of Biscay. In the southern part of the French continental shelf, anchovy occurred in a low density layer, close to the sea bottom (15 m from the sea bed). Fish were found in small dots schools. Moreover, in spite the gap in the coverage, anchovy could be distributed throughout the continental shelf. In IXa, in spite the purse seine caught inside the Muros Ria 300 kg, no schools were detected by the echo-sounder in the survey track.

Total abundance was estimated to be 15 thousand tonnes (figure 10, tables 7 and 8). There was a length size gradient from the south to the north. Close to the mouth of Garonne river, the highest fish were found.

4 CONCLUSIONS

- In the Cantabrian area, retention processes were important. High and dense patches of surface plankton were found close to the coast (30000 squared meters of integration).
- Temperature and salinity were lower than those of 1998. The influence of the rivers in France were also important, being a thermohaline gradient parallel to the coast.
- Distribution area of sardine agreed with that found for sardine eggs (figure 11).
- Estimated biomass of sardine in Spain increased but the number remained at the same level.
- Part of the horse mackerel population could be no accessible to the echosounder because of the blind area of the echo-sounder close to the sea bottom.
- French continental shelf was not fully covered, and the south was steamed in bad weather conditions. In spite of that, the fish abundance seems to be similar to that found in the previous years.
- At the end of the winter, anchovy appears to be concentrated in French waters.

5 REFERENCES

Anon, 1998. Report of the Planning Group for Pelagic Acoustic surveys in ICES Sub-Areas VIII and IX, a Coruña, 30-31 January 1998. *ICES CM 1998/G:2*, 17pp.

Anon, 1999. Report of Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine and Anchovy, 28 September-7 October 1998. *ICES CM1999/ACFM:6*.

Anon, 1999. Report of the Planning Group for Pelagic Acoustic surveys in ICES Sub-Areas VIII and IX, a Coruña, 30-31 January 1998. *ICES CM 1998/G:2*, 17pp.

Zone	Area	No	Mean	σ^2	Model	v^*	nugget/model	Surface	Fishing st.	No	Biomass
VIIIb	Francia sur	136	60.8	41336.07	11000+sph(16000;2.3)	298.84	27.10%	1089.59	P03, P04	380894499	11056
	Francia norte	92	544.66	2211067	Sph(0.4+e06;2.5)+Sph(1.0+e06)	31725.38	0.00%	1024.21	P07, P08, P09, P10	2184366675	114907
			Total					2113.8		2565261174	125962.6
VIIIc-East	Viveiro	5	515	137375	n.a.	n.a.	n.a.	28.4	P19	47749954	3313
	Caridad	3	475	46875	n.a.	n.a.	n.a.	34.56	P27,P28	53156647	3731
	Avilés	11	709.09	587251.9	n.a.	n.a.	n.a.	79.11	P27,P28	181644807	12749
	Llanes	2	504	492032	n.a.	n.a.	n.a.	9.12	P27,P28	14883861	1045
	Tina Menor	3	250	187500	n.a.	n.a.	n.a.	8.1	P37, P38, P42	8374158	436
	Laredo	9	599.56	1206534	n.a.	n.a.	n.a.	91.48	P37, P38, P42	226816635	11804
	Euskadi	9	44.89	17733.86	n.a.	n.a.	n.a.	43.67	P37, P38, P42	8106789	422
			Total					294.44		540732849	33499
VIIIc-West	Laxe	7	478.57	894880.9	n.a.	n.a.	n.a.	38.23	P16	75488154	3776
	Artabro	8	168.75	127812.5	n.a.	n.a.	n.a.	47.64	P16	33169931	1659
			Total					85.87		108658084.3	5435.2
IXa-North	Vigo	2	1137.5	2587813	n.a.	n.a.	n.a.	8.81	P12	41348177.3	2068.2
	Pontevedra	16	114.06	51664.06	n.a.	n.a.	n.a.	22.99	P12	10819354.5	541.2
	Muros	12	175	95227.27	n.a.	n.a.	n.a.	34.13	P12	24643556.4	1232.7
			Total					65.93		76811088.2	3842.1
Total France								2113.8		3291463196	168739
Total Spain								446.24		726202021.6	42776
TOTAL								2560		3408299527	174582.8

Table 1: Input values and main results for sardine

BIOMASS (tonnes). ZONE: IXa-North														
Length	AGE GROUPS												Total	No fish
	1	2	3	4	5	6	7	8	9	10	11	12		
11														
11.5														
12														
12.5														
13	8.40												8.40	483
13.5	18.50												18.50	966
14	103.10												103.10	4831
14.5	102.90												102.90	4348
15	189.70												189.70	7246
15.5	125.40												125.40	4348
16	91.70												91.70	2899
16.5	100.60												100.60	2899
17	96.08	13.73											109.80	2899
17.5	23.94	11.97	3.99										39.90	966
18	6.19	37.11											43.30	966
18.5	9.78	83.16	19.57	4.89									117.40	2415
19	5.08	111.83	30.50	5.08									152.50	2899
19.5	10.99	109.85	76.90	10.99	10.99								219.70	3865
20	49.33	295.95	98.65	147.98									591.90	9662
20.5		403.33	134.44	67.22									605.00	9179
21		62.70	125.40	188.10									376.20	5314
21.5				366.80									366.80	4831
22				196.25			196.25						392.50	4831
22.5							42.00						42.00	483
23							44.80						44.80	483
23.5														
24														
24.5														
25														
25.5														
26														
Total	942	1130	489	987	11		283						3842	76811
%	24.51	29.40	12.74	25.70	0.29		7.37						100.00	
M. weight	28.27	58.84	62.07	71.65	56.84		83.63						46.95	
No Fish	32569	19085	7853	13729	193		3382						76811	76811
%	42.40	24.85	10.22	17.87	0.25		4.40						100.00	
M. length	15.65	19.98	20.34	21.34	19.75		22.46						18.53	18.53
s.d.	1.34	0.91	0.77	0.75			0.36						2.76	2.76

Table 2a: Sardine assessment in IXa-North (Number in thousand, biomass in tonnes)

BIOMASS (tonnes). ZONE: VIIIc-West														
Length	AGE GROUPS												Total	No fish
	1	2	3	4	5	6	7	8	9	10	11	12		
11														
11.5														
12														
12.5														
13	11.80												11.80	683
13.5	26.20												26.20	1367
14	146.00												146.00	6834
14.5	145.70												145.70	6150
15	268.30												268.30	10251
15.5	177.30												177.30	6150
16	129.80												129.80	4100
16.5	142.20												142.20	4100
17	155.30												155.30	4100
17.5	56.40												56.40	1367
18	61.30												61.30	1367
18.5	166.20												166.20	3417
19	71.93	143.87											215.80	4100
19.5	44.40	177.60	88.80										310.80	5467
20	41.87	586.11	167.46	41.87									837.30	13668
20.5		320.96	427.95	53.49	53.49								855.90	12984
21		152.06	126.71	228.09	25.34								532.20	7517
21.5		27.31	245.75	163.83	81.92								518.80	6834
22			201.93	252.41	50.48	25.24	25.24						555.30	6834
22.5			17.79	5.93	17.79	17.79							59.30	683
23			6.33	18.99	18.99	6.33	12.66						63.30	683
23.5														
24														
24.5														
25														
25.5														
26														
Total	1645	1408	1283	765	248	49	38						5435	108658
%	30.26	25.90	23.60	14.07	4.56	0.91	0.70						100.00	
M. weight	30.29	61.60	68.78	74.37	75.38	84.51	84.66						46.95	
No Fish	52718	22802	18573	10254	3280	584	447						108658	108658
%	48.52	20.98	17.09	9.44	3.02	0.54	0.41						100.00	
M. length	16.01	20.29	21.05	21.60	21.70	22.54	22.56						18.53	18.53
s.d.	1.59	0.58	0.77	0.64	0.72	0.35	0.46						2.76	2.76

Table 2b: Sardine assessment in VIIIc-w

BIOMASS (tonnes). ZONE: VIIIc-Ew (7°20'-3°20')														
Length	AGE GROUPS												Total	No fish
	1	2	3	4	5	6	7	8	9	10	11	12		
11	0.30												0.30	24
11.5	2.90												2.90	245
12	14.80												14.80	1089
12.5	10.70												10.70	697
13	8.70												8.70	506
13.5	2.40												2.40	125
14	3.20												3.20	150
14.5	1.10												1.10	45
15	4.10												4.10	155
15.5	3.80												3.80	131
16	98.90												98.90	3125
16.5	81.30												81.30	2343
17	11.30												11.30	299
17.5	9.90												9.90	240
18	173.70												173.70	3873
18.5	476.00												476.00	9788
19		876.90											876.90	16659
19.5		1156.10											1156.10	20340
20		1006.30	1006.30										2012.60	32850
20.5		907.30	1814.60										2721.90	41293
21		839.58	839.58	1679.15									3358.30	47437
21.5		1005.91	502.96	1005.91		502.96	502.96						3520.70	46381
22			1113.37	1113.37	371.12	371.12	371.12						3340.10	41102
22.5			304.00	912.00	304.00	304.00							1824.00	20998
23				131.22	328.05	131.22	131.22						721.70	7783
23.5				61.21	61.21	183.64	122.43						428.50	4337
24				59.73			59.73			119.45			238.90	2271
24.5				33.08	66.16		33.08		33.08				165.40	1479
25				2.00		2.00	1.00						5.00	42
25.5														
26														
Total	903	5792	5581	4998	1131	1495	1222		33	119			21273	305809
%	4.25	27.23	26.23	23.49	5.31	7.03	5.74		0.16	0.56			100.00	
M. weight	38.10	62.43	69.80	77.76	88.02	82.91	82.66		111.83	105.19			68.42	
No Fish	22836	92300	79639	64085	12815	17983	14719		296	1136			305809	305809
%	7.47	30.18	26.04	20.96	4.19	5.88	4.81		0.10	0.37			100.00	
M. length	17.28	20.38	21.15	21.93	22.85	22.40	22.38		24.75	24.25			21.01	21.01
s.d.	2.00	0.84	0.76	0.68	0.62	0.66	0.82						1.60	1.60

Table 2c: Sardine assessment in VIIIc-E, western part

BIOMASS (tonnes). ZONE: VIIIc-Ee (3°20'W-1°30'W)														
Length	AGE GROUPS												Total	No fish
	1	2	3	4	5	6	7	8	9	10	11	12		
11	7.20												7.20	687
11.5	82.20												82.20	6869
12	414.40												414.40	30537
12.5	299.40												299.40	19567
13	243.80												243.80	14196
13.5	67.50												67.50	3518
14	89.80												89.80	4205
14.5	29.60												29.60	1249
15	113.90												113.90	4352
15.5	105.60												105.60	3665
16	204.50												204.50	6456
16.5	110.70												110.70	3191
17	88.30												88.30	2333
17.5	27.50												27.50	666
18	53.40												53.40	1192
18.5	180.70												180.70	3717
19		220.60											220.60	4191
19.5		200.30											200.30	3525
20		316.85	316.85										633.70	10343
20.5		157.17	314.33										471.50	7152
21		364.80	364.80	729.60									1459.20	20611
21.5		437.54	218.77	437.54		218.77	218.77						1531.40	20175
22			664.53	664.53	221.51	221.51	221.51						1993.60	24533
22.5			208.57	625.70	208.57	208.57							1251.40	14407
23				202.02	505.05	202.02	202.02						1111.10	11985
23.5				43.80	43.80	131.40	87.60						306.60	3102
24				123.05			123.05			246.10			492.20	4679
24.5				58.76	117.52		58.76		58.76				293.80	2628
25				56.64		56.64	28.32						141.60	1192
25.5														
26														
Total	2119	1697	2088	2942	1096	1039	940		59	246			12226	234923
%	17.33	13.88	17.08	24.06	8.97	8.50	7.69		0.48	2.01			100.00	
M. weight	18.79	64.45	72.80	80.76	90.62	86.26	88.09		111.83	105.19			44.38	
No Fish	106402	26188	28553	36245	12069	11994	10607		526	2339			234923	234923
%	45.29	11.15	12.15	15.43	5.14	5.11	4.52		0.22	1.00			100.00	
M. length	13.65	20.60	21.45	22.20	23.07	22.70	22.86		24.75	24.25			18.19	18.19
s.d.	1.88	0.89	0.83	0.89	0.67	0.84	1.02						4.41	4.41

Figure 2d: Sardine assessment in VIIIc-E eastern part.

BIOMASS (tonnes). ZONE: VIIIb														
Length	AGE GROUPS												Total	No fish
	1	2	3	4	5	6	7	8	9	10	11	12		
11														
11.5														
12														
12.5	368.90												368.90	27209
13	1312.40												1312.40	85676
13.5	1529.90												1529.90	88787
14	3726.60												3726.60	193075
14.5	4486.60												4486.60	208335
15	4924.40												4924.40	205683
15.5	3092.40												3092.40	116584
16	1291.90												1291.90	44102
16.5	361.60	90.40											452.00	14013
17		717.30											717.30	20256
17.5		1115.40											1115.40	28762
18		2996.30											2996.30	70741
18.5	996.78	4485.53		498.39									5980.70	129583
19		8316.18	519.76	519.76									9355.70	186452
19.5		4919.65	655.95										5575.60	102425
20		5139.41	1713.14	685.25									7537.80	127898
20.5	546.79	2187.16	5467.90	2187.16		546.79							10935.80	171719
21		1106.24	6637.43	1659.36	1659.36	553.12							11615.50	169105
21.5		418.68	2093.39	4186.79	837.36	418.68							7954.90	107565
22		485.78	2428.90	3886.24	2428.90	485.78							9715.60	122222
22.5		453.85	1361.54	3176.93	2269.24	907.69	453.85						8623.10	101084
23			502.48	2512.38	2009.91	1507.43	1507.43	502.48					8542.10	93453
23.5				252.88	1517.27	758.64	1011.51						3540.30	36201
24					483.44	966.87	2900.62	966.87					5317.80	50893
24.5				280.00	560.00	280.00	1120.00	280.00					2520.00	22603
25					248.60		745.80	248.60		248.60			1491.60	12555
25.5														
26							1001.30						1001.30	7450
Total	22638	32432	21380	19845	12014	6425	8741	1998		249			125722	2544431
%	18.01	25.80	17.01	15.78	9.56	5.11	6.95	1.59		0.20			100.00	
M. weight	21.89	50.93	67.68	73.69	84.13	84.82	103.93	102.98		118.80			44.27	
No Fish	1010845	630603	314287	266613	141883	75065	83688	19354		2093			2544431	2544431
%	39.73	24.78	12.35	10.48	5.58	2.95	3.29	0.76		0.08			100.00	
M. length	14.83	19.34	21.15	21.73	22.65	22.71	24.21	24.14		25.25			18.51	18.51
s.d.	1.18	1.02	0.82	1.18	0.98	1.17	0.91	0.64					3.39	3.39

Table 2e: Sardine assessment in VIIIb (France)

BIOMASS (tonnes). ZONE: Spain														
Length	AGE GROUPS												Total	No fish
	1	2	3	4	5	6	7	8	9	10	11	12		
11	7.5												7.50	711
11.5	85.1												85.10	7114
12	429.2												429.20	31625
12.5	310.1												310.10	20264
13	272.7												272.70	15869
13.5	114.6												114.60	5977
14	342.1												342.10	16020
14.5	279.3												279.30	11792
15	576												576.00	22005
15.5	412.1												412.10	14294
16	524.9												524.90	16580
16.5	434.8												434.80	12534
17	350.975	13.725											364.70	9631
17.5	117.74	11.97	3.99										133.70	3239
18	294.5857	37.11429											331.70	7398
18.5	832.6833	83.15833	19.56667	4.891667									940.30	19337
19	77.01667	1353.2	30.5	5.083333									1465.80	27849
19.5	55.385	1643.85	165.695	10.985	10.985								1886.90	33197
20	91.19	2205.21	1589.26	189.84									4075.50	66523
20.5		1788.763	2691.328	120.716	53.49375								4654.30	70608
21		1419.132	1456.489	2824.936	25.34286								5725.90	80879
21.5		1470.762	967.4759	1974.089	81.91579	721.7286	721.7286						5937.70	78221
22			1979.827	2226.559	643.1152	617.8742	814.1242						6281.50	77300
22.5			530.3567	1543.63	530.3567	530.3567	42						3176.70	36571
23			6.33	352.2264	852.0809	339.5664	390.6964						1940.90	20934
23.5				105.0143	105.0143	315.0429	210.0286						735.10	7439
24				182.775			182.775			365.55			731.10	6950
24.5				91.84	183.68		91.84		91.84				459.20	4107
25				58.64		58.64	29.32						146.60	1234
25.5														
26														
Total	5608	10027	9441	9691	2486	2583	2483		92	366			42776	726202
%	13.11	23.44	22.07	22.66	5.81	6.04	5.80		0.21	0.85			100.00	
M. weight	24.52	62.20	69.82	77.64	87.33	84.25	84.75		111.83	105.19			54.40	
No Fish	214525	160375	134618	124313	28357	30562	29155		821	3475			726202	726202
%	29.54	22.08	18.54	17.12	3.90	4.21	4.01		0.11	0.48			100.00	
M. length	14.92	20.35	21.15	21.91	22.79	22.52	22.56		24.75	24.25			19.46	19.46
s.d.	2.20	0.84	0.81	0.80	0.81	0.75	0.89						3.33	3.33

Table 2f: Sardine assessment in Spain

Zone	Area	No	Mean	$\hat{\sigma}^2$	Model	ν^*	nugget/model	Surface	Fishing st.	No	Biomass
VIIIb	Francia sur	99	88.95	24473.56	11000+Sph(9000;7)	366.22	30.3/69.7%	886.8	P02, P05	942915289	219142.5
	Francia norte-t	50	17.52	427.44	130*sph(300;6)	15.78	16.5/83.5%	506.41	P11	89024936.5	26717.6
	Francia norte-c	68	4.74	37.84	7+Sph(16;7)	0.74	13.9/86.1%	903.38	P07, P08, P10	97418652.1	8379.1
	Total							2296.59		1129358878	254239.2
VIIIc-Este	Masma	123	12.62	479.32	50+Exp(160;12)	1.36	30/70	1040	P20, P22, P23	155374928	37334.9
	Cantabrico	239	38.44	6085.391	3000+Exp(3000;10)	20.08	62.5/37.5	2099.37	1, P33, P34, P35, P39, P41, I	822561322	244152.8
	Total							3139.37		977936250	281488
VIIIc-Oeste	Artlabro	11	0.18	0.1636	n.a.	n.a.	n.a.	86.89	P15	186238.8	42.6
	Ortegal	16	3.5625	9.4625	n.a.	n.a.	n.a.	158.63	P18	6807680.7	1527.6
	Total							245.52		6993919.5	1570.2
IXa-Norte											
			Total							0	0
Total Francia										2114289047	254239
Total España										984930169.8	283057.9
TOTAL										2114475286	537297

Table 3: Input values and main results for mackerel assessment

BIOMASS (tonnes). ZONE: VIIIb														
Length	AGE GROUPS												Total	No fish
	1	2	3	4	5	6	7	8	9	10	11	12		
15														
16	50.00												50.00	1929
17	180.30												180.30	5768
18	573.20												573.20	15351
19	454.60												454.60	10289
20	760.50												760.50	14670
21	2479.00												2479.00	41066
22	4060.70												4060.70	58172
23	2695.30												2695.30	33602
24	480.30												480.30	5242
25	36.60												36.60	352
26	293.40												293.40	2491
27	1935.80												1935.80	14603
28	2747.00												2747.00	18487
29	3811.39	1361.21											5172.60	31179
30	2884.80	2884.80	1442.40										7212.00	39078
31	10730.90	8584.72	2146.18										21461.80	104900
32	3119.23	21834.59	9357.68										34311.50	151763
33		20724.22	23026.91	4605.38	2302.69								50659.20	203387
34		13812.85	13812.85	5525.14		2762.57							35913.40	131249
35		5551.05	12952.45	7401.40									25904.90	86410
36		3069.52	9208.56	6139.04	1534.76	3069.52							23021.40	70267
37			2788.60	6971.50	1394.30	5577.20							16731.60	46843
38			820.55	1641.11	3282.22	820.55	3282.22	820.55					10667.20	27456
39				836.79	278.93	1394.64	1115.71	278.93					3905.00	9260
40				723.40	361.70	1085.10			361.70				2531.90	5543
41														
42														
43														
44														
45														
Total	37293	77823	75556	33844	9155	14710	4398	1099	362				254239	1129359
%	14.67	30.61	29.72	13.31	3.60	5.79	1.73	0.43	0.14					
M. weight	102.20	238.62	264.21	307.03	325.78	340.55	396.26	396.26	456.77				207.97	
No Fish	326875	323943	283856	109418	27734	42874	11094	2773	792					1129359
%	28.94	28.68	25.13	9.69	2.46	3.80	0.98	0.25	0.07					
M. length	25.35	33.05	34.12	35.77	36.44	36.94	38.74	38.74	40.50					31.66
s.d.	4.59	1.45	1.57	1.64	2.24	1.70	0.43	0.43						5.03

Table 4a: Mackerel assessment in VIIIb (numbers in thousands and biomass in tonnes)

BIOMASS (tonnes). ZONE: VIIIc-ee														
Length	AGE GROUPS												Total	No fish
	1	2	3	4	5	6	7	8	9	10	11	12		
15														
16														
17														
18														
19														
20														
21	65.10												65.10	1079
22	513.40												513.40	7355
23	1246.80												1246.80	15543
24	62.20												62.20	679
25	70.70												70.70	679
26														
27	215.00												215.00	1622
28	839.00												839.00	5647
29	2397.32	856.18											3253.50	19611
30	1629.44	1629.44	814.72										4073.60	22073
31	4791.85	3833.48	958.37										9583.70	46842
32	1812.95	12690.68	5438.86										19942.50	88208
33		13307.60	14786.23	2957.25	1478.62								32529.70	130600
34		9136.38	9136.38	3654.55		1827.28							23754.60	86813
35		3970.03	9263.40	5293.37									18526.80	61799
36		2964.19	8892.56	5928.37	1482.09	2964.19							22231.40	67857
37			5214.13	13035.33	2607.07	10428.27							31284.80	87588
38			2554.74	5109.48	10218.95	2554.74	10218.95	2554.74					33211.60	85482
39				3860.14	1286.71	6433.57	5146.86	1286.71					18014.00	42717
40				3123.46	1561.73	4685.19			1561.73				10932.10	23933
41					2668.84		1334.42	1334.42	1334.42				6672.10	13511
42						1412.73		1412.73	1412.73				4238.20	7954
43						2341.60							2341.60	4080
44						550.40							550.40	892
45														
Total	13644	48388	57059	42962	21304	33198	16700	6589	4309				244153	822561
%	5.59	19.82	23.37	17.60	8.73	13.60	6.84	2.70	1.76					
M. weight	148.33	242.68	275.62	336.22	377.14	387.80	404.64	437.34	490.48				286.07	
No Fish	87322	197966	205125	126618	55936	84632	41209	14980	8772					822561
%	10.62	24.07	24.94	15.39	6.80	10.29	5.01	1.82	1.07					
M. length	28.48	33.23	34.58	36.80	38.14	38.48	38.99	39.95	41.41					34.98
s.d.	3.57	1.50	1.77	1.88	2.04	2.19	0.80	1.60	0.83					3.67

Table 4b: Mackerel assessment in VIIIc-e eastern part (6°10'-1°30'W)

BIOMASS (tonnes). ZONE: VIIIc-ew														
Length	AGE GROUPS												Total	No fish
	1	2	3	4	5	6	7	8	9	10	11	12		
15														
16														
17														
18														
19														
20														
21	31.10												31.10	515
22	684.90												684.90	9811
23	1633.30												1633.30	20363
24	660.30												660.30	7206
25														
26														
27	34.10												34.10	257
28	38.20												38.20	257
29	318.54	113.76											432.30	2606
30	176.36	176.36	88.18										440.90	2389
31	414.70	331.76	82.94										829.40	4054
32	239.22	1674.53	717.65										2631.40	11639
33		2183.07	2425.64	485.13	242.56								5336.40	21425
34		2688.19	2688.19	1075.28		537.64							6989.30	25543
35		930.39	2170.90	1240.51									4341.80	14483
36		405.67	1217.00	811.33	202.83	405.67							3042.50	9287
37			530.32	1325.79	265.16	1060.63							3181.90	8908
38			233.40	466.80	933.60	233.40	933.60	233.40					3034.20	7810
39				404.83	134.94	674.71	539.77	134.94					1889.20	4480
40				366.89	183.44	550.33			183.44				1284.10	2811
41					117.60		58.80	58.80	58.80				294.00	595
42						52.87		52.87	52.87				158.60	298
43						367.00							367.00	639
44														
45														
Total	4231	8504	10154	6177	2080	3882	1532	480	295				37335	155375
%	11.33	22.78	27.20	16.54	5.57	10.40	4.10	1.29	0.79					
M. weight	91.17	251.55	275.22	319.26	360.85	370.97	402.57	419.75	475.49				219.01	
No Fish	44370	33600	36661	19168	5698	10317	3802	1139	620					155375
%	28.56	21.62	23.60	12.34	3.67	6.64	2.45	0.73	0.40					
M. length	24.46	33.60	34.56	36.21	37.62	37.95	38.93	39.44	41.01					32.18
s.d.	2.69	1.41	1.46	1.85	2.19	2.42	0.66	1.31	0.76					5.47

Table 4c: Mackerel assessment in VIIIc-e (western part -7°20'-6°10'-)

BIOMASS (tonnes). ZONE: VIIIc-w														
Length	AGE GROUPS												Total	No fish
	1	2	3	4	5	6	7	8	9	10	11	12		
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														
25														
26														
27	11.10												11.10	84
28	49.60												49.60	334
29	74.57	26.63											101.20	610
30	91.88	91.88	45.94										229.70	1245
31	68.45	54.76	13.69										136.90	669
32	25.41	177.86	76.23										279.50	1237
33		124.28	138.09	27.62	13.81								303.80	1220
34		94.96	94.96	37.98		18.99							246.90	902
35		37.56	87.65	50.09									175.30	585
36		4.39	13.16	8.77	2.19	4.39							32.90	100
37														
38			0.25	0.51	1.02	0.25	1.02	0.25					3.30	8
39														
40														
41														
42														
43														
44														
45														
Total	321	612	470	125	17	24	1	0					1570	6994
%	20.44	39.00	29.93	7.96	1.08	1.51	0.06	0.02						
M. weight	176.05	225.07	247.03	280.23	261.43	282.65	388.52	#####					221.31	
No Fish	1812	2698	1888	445	65	83	3	1						6994
%	25.91	38.57	26.99	6.36	0.93	1.19	0.04	0.01						
M. length	30.05	32.45	33.41	34.76	34.01	34.85	38.50							32.28
s.d.	1.28	1.60	1.58	0.92	1.30	0.81								2.08

Table 4d: Mackerel assessment in VIIIc-w

BIOMASS (tonnes). ZONE: Spain														
Length	AGE GROUPS												Total	No fish
	1	2	3	4	5	6	7	8	9	10	11	12		
15														
16														
17														
18														
19														
20														
21		96											96.20	1593
22		1198											1198.30	17166
23		2880											2880.10	35906
24		723											722.50	7885
25		71											70.70	679
26														
27		260											260.20	1963
28		927											926.80	6238
29		2790	997										3787.00	22827
30		1898	1898	949									4744.20	25707
31		5275	4220	1055									10550.00	51565
32		2078	14543	6233									22853.40	101083
33			15615	17350	3470	1735							38169.90	153245
34			11920	11920	4768		2384						30990.80	113259
35			4938	11522	6584								23043.90	76867
36			3374	10123	6748	1687	3374						25306.80	77243
37				5744	14361	2872	11489						34466.70	96496
38				2788	5577	11154	2788	11154	2788				36249.10	93300
39					4265	1422	7108	5687	1422				19903.20	47197
40					3490	1745	5236			1745			12216.20	26744
41						2786		1393	1393	1393			6966.10	14107
42							1466		1466	1466			4396.80	8251
43							2709						2708.60	4719
44							550						550.40	892
45														
Total	18195	57504	67684	49263	23401	37104	18233	7069	4604				283058	984930
%	6.43	20.32	23.91	17.40	8.27	13.11	6.44	2.50	1.63					
M. weight	127.52	243.73	275.33	333.78	375.48	385.85	404.46	436.08	489.48				274.18	
No Fish	133504	234264	243674	146231	61699	95033	45014	16120	9392					984930
%	13.55	23.78	24.74	14.85	6.26	9.65	4.57	1.64	0.95					
M. length	27.17	33.27	34.57	36.71	38.09	38.42	38.99	39.92	41.39					34.52

Table 4e: Mackerel assessment in Spain

Zone	Area	No	Mean	$\hat{\sigma}^2$	Model	v^*	nugget/model	Surface	Fishing St.	No	Biomass
VIIIb	Francia norte c	21	51.71	1107.51	500+Sph(1100;4)	134.59	17.7/82.3%	336.22	p06, p09	91412765	708
	Francia norte p	65	294.09	163820.5	40000+Sph(110000;4)	4364.73	14.1/85.9%	750.72	p10, p11	294798682	19827
	Francia sur	127	315.13	310473.4	100000+Sph(150000;4)	3802.92	20.7/79.3%	1158.44	p01, p02, p03, p04, p05	760008554	30095
	Total							2245.38		1146220001	50630.2
VIIIc-Este	Masma	153	156.64	75187.63	30000+Sph(40000;3)	611.25	32.1/67.9	1337.46	p20, p21	134351366	28861
	Picos	152	197.22	84160.26	30000+Sph(55000;4)	788.4	25/75	1356.48	p26, p29, p31, p35	188508578	35389
	Euskadi	64	179.05	41966.43	9000+Sph(30000;3)	842.6	16.7/83.3	566.45	p39, p40, p43	95715105	11624
	Laredo-chin	6	150.67	115754.6	n.a	n.a		49.07	p37, p42	39731521	356
	Total							3309.46		458306570	76230
VIIIc-Oeste	Artabro-xur	24	288.125	311201.6	n.a	n.a		234.21	p15	35038726	10353
	Artabro-chin	14	126.07	23814.07	n.a	n.a		120.4	p16	88980161	706
	Capelada-xur	48	69.61	25487.56	12000+Sph(13000;8)	547.35	45.7/54.3	456.73	p18	19398685	4511
	Total							811.34		143417571.7	15570.5
IXa-Norte	Vigo-chincho	6	166.67	166666.7	n.a	n.a		8.79	p16	8588182	68
	Vigo-xurelo	7	70	1225	n.a	n.a		86.56	p15	2055746	608
	Arousa-chin	6	108.33	70416.7	n.a	n.a		8.69	p16	5518531	44
	Muros-chin	30	180	268077.6	n.a	n.a		75.94	p16	80130538	636
	Total							179.98		96292996.5	1355.3
Total Francia								2245.38		1146220001	50630.2
Total España								4300.78		698017137.7	93156
TOTAL								6546		1844237139	143786

Table 5: Input values and main results for horse mackerel assessment

BIOMASS (tonnes). ZONE: VIIIb																	
Length	AGE GROUPS															Total	No fish
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
5																	
6																	
7	5.40															5.40	2047
8	56.30															56.30	14605
9	562.00															562.00	103662
10	1596.70															1596.70	216721
11	1812.60															1812.60	186160
12	1140.10															1140.10	90694
13	403.60															403.60	25363
14	179.30															179.30	9051
15	448.10															448.10	18437
16	130.38	651.92														782.30	26574
17	50.94	356.56														407.50	11560
18	57.28	630.05	57.28													744.60	17815
19		63.28	174.02													237.30	4832
20		153.93	307.87													461.80	8068
21		308.58	848.58	77.14												1234.30	18634
22		2034.29	1525.71													3560.00	46754
23		1972.82	5260.86	1315.22												8548.90	98268
24		1685.43	2809.04	3370.85	3370.85	1123.62	561.81									12921.60	130724
25			206.39	825.54	3095.79	1238.31	412.77									5778.80	51718
26			106.88	213.76	320.64	1389.44	106.88									2137.60	17003
27				490.97	490.97	736.45	490.97	613.71	122.74							2945.80	20918
28					311.48	560.67	436.08	186.89	186.89	124.59						1806.60	11498
29											124.59						
30											30.28	60.56	15.14				
31																	
32																	
33																	
34																	
35																	
36																	
37																	
38																	
39																	
40																	
41																	
42																	
Total	6443	7857	11297	6332	7856	5460	2929	1330	481	266	136	104	47	63	31	50630	1146220
%	12.73	15.52	22.31	12.51	15.52	10.78	5.79	2.63	0.95	0.53	0.27	0.21	0.09	0.12	0.06	100.00	
M. weight	8.41	58.18	80.29	96.50	106.14	117.84	129.84	153.72	160.90	173.60	206.61	195.90	178.54	189.39	233.35	27.38	
No fish	673984	122416	134729	63179	71329	44506	21494	8361	2883	1479	639	517	257	321	129	1146220	
%	58.80	10.68	11.75	5.51	6.22	3.88	1.88	0.73	0.25	0.13	0.06	0.05	0.02	0.03	0.01	100.00	
M. length	10.96	20.61	22.89	24.31	25.08	25.95	26.78	28.30	28.72	29.44	31.16	30.63	29.71	30.29	32.43	16.11	
s.d.	1.51	2.97	1.33	1.10	1.14	1.52	2.15	1.33	1.56	1.59	1.01	1.43	1.18	1.58	0.80	6.53	

Table 6a: horse mackerel assessment in VIIIb (France). (Numbers in thousands biomass in tonnes).

BIOMASS (tonnes). ZONE: VIIIc-Ee																	
Length	AGE GROUPS															Total	No fish
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
5																	
6																	
7																	
8																	
9	44.50															44.50	6686
10	256.50															256.50	28587
11	62.40															62.40	5295
12	8.20															8.20	546
13	3.30															3.30	172
14	4.70															4.70	198
15																	
16																	
17																	
18																	
19																	
20																	
21																	
22																247.80	2825
23		141.60	106.20													1558.00	15590
24		359.54	958.77	239.69												3040.80	26862
25		396.63	661.04	793.25	793.25	264.42	132.21									3484.30	27307
26			124.44	497.76	1866.59	746.64	248.88									2255.40	15754
27			112.77	225.54	338.31	1466.01	112.77									561.50	3511
28				93.58	93.58	140.38	93.58	116.98	23.40							110.10	619
29					18.98	34.17	26.58	11.39	11.39	7.59							
30					6.39	25.57	54.33	35.16	19.18	6.39	12.78	3.20				163.00	748
31					5.44	21.76	29.92	40.80	27.20	10.88	19.04	13.60	2.72	2.72	5.44	179.50	748
32																	
33																	
34																	
35																	
36																	
37																	
38																	
39																	
40																	
41																	
42																	
Total	380	898	1963	1850	3123	2699	698	204	81	25	32	17	3	3	5	11980	135447
%	3.17	7.49	16.39	15.44	26.06	22.53	5.83	1.71	0.68	0.21	0.27	0.14	0.02	0.02	0.05	100.00	
M. weight	8.41	99.51	102.96	115.49	122.19	132.55	133.59	175.00	190.36	205.62	225.04	229.86	234.45	234.45	234.45	65.59	
No fish	41483	8716	18407	15468	24743	19705	5014	1127	412	117	138	71	11	11	23	135447	
%	30.63	6.43	13.59	11.42	18.27	14.55	3.70	0.83	0.30	0.09	0.10	0.05	0.01	0.01	0.02	100.00	
M. length	10.27	23.47	23.74	24.66	25.13	25.83	25.89	28.34	29.15	29.91	30.82	31.04	31.25	31.25	31.25	20.41	
s.d.	0.67	0.74	0.86	0.99	0.75	0.94	1.69	1.60	1.70	1.32	0.50	0.41				6.85	

Table 6b: Horse mackerel assessment in VIIIc-E (eastern part -3°20'-1°30' W)

BIOMASS (tonnes). ZONE: VIIIc-Ew																
Length	AGE GROUPS															Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																
16																
17																
18																
19																
20																
21																
22																
23		22.04	58.77	14.69												95.50
24		131.63	219.39	263.27	263.27	87.76	43.88									1009.20
25			93.39	373.56	1400.84	560.34	186.78									2614.90
26			94.62	189.24	283.86	1230.06	94.62									1892.40
27				417.27	417.27	625.90	417.27	521.58	104.32							2503.60
28					1101.55	1982.79	1542.17	660.93	660.93	440.62						6389.00
29				411.11	2466.68	2466.68	6166.69	2877.79		411.11		411.11	411.11	411.11		81256
30					738.99	2955.95	6281.40	4064.44	2216.96	738.99	1477.98	369.49				86436
31					307.40	1229.60	1690.70	2305.50	1537.00	614.80	1075.90	768.50	153.70	153.70	307.40	42249
32						440.27	528.32	528.32	616.37	792.48	704.42	352.21		176.11	176.11	4314.60
33						27.28	72.75	45.47	36.37	45.47	36.37	45.47	18.19	36.37	45.47	409.20
34																1418
35																
36																
37																
38																
39																
40																
41																
42																
Total		154	466	1669	6980	11607	17025	11004	5172	3043	3295	1947	583	777	529	64250
%		0.24	0.73	2.60	10.86	18.06	26.50	17.13	8.05	4.74	5.13	3.03	0.91	1.21	0.82	100.00
M. weight		107.64	114.92	140.33	162.16	180.81	198.64	205.62	214.58	215.82	228.35	223.47	203.38	214.33	245.09	191.54
No fish		1383	3919	11415	41256	61758	83148	51966	23400	13673	14058	8472	2787	3518	2106	322860
%		0.43	1.21	3.54	12.78	19.13	25.75	16.10	7.25	4.23	4.35	2.62	0.86	1.09	0.65	100.00
M. length		24.09	24.62	26.32	27.63	28.65	29.57	29.91	30.34	30.40	30.98	30.75	29.80	30.33	31.72	29.21
s.d.		0.37	0.93	1.75	2.02	1.90	1.25	1.18	1.26	1.42	0.80	1.08	0.99	1.36	0.63	1.95

Table 6c: Horse mackerel assessment in VIIIc-E (western part (7°20'-3°20' W))

BIOMASS (tonnes). ZONE: VIIIc-W																	
Length	AGE GROUPS															Total	No fish
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
5																	
6																	
7		7.60														7.60	2307
8		44.80														44.80	9392
9		195.10														195.10	29330
10		378.50														378.50	42183
11		40.80														40.80	3460
12		17.40														17.40	1153
13		22.00														22.00	1153
14																	
15																	
16																	
17																	
18																	
19																	
20																	
21																	
22																	
23																	
24			3.53	5.89	7.07	7.07	2.36	1.18								27.10	240
25																	
26				1.72	3.43	5.15	22.30	1.72								34.30	240
27					26.10	26.10	39.15	26.10	32.63	6.53						156.60	979
28						22.07	39.72	30.90	13.24	13.24	8.83					128.00	719
29					15.79	94.75	94.75	236.88	110.55	15.79		15.79	15.79	15.79		615.90	3121
30						55.83	223.31	474.53	307.05	167.48	55.83	111.65	27.91			1423.60	6530
31						72.09	288.38	396.52	540.70	360.47	144.19	252.33	180.23	36.05	36.05	72.09	2379.10
32							251.55	301.86	301.86	352.17	452.79	402.48	201.24		100.62	100.62	2465.20
33							153.57	409.51	255.94	204.76	255.94	204.76	255.94	102.38	204.76	255.94	2303.50
34							80.77	403.83		242.30	161.53	323.06	323.06	161.53	242.30	161.53	2099.90
35								93.81	93.81		187.61	281.42	187.61	93.81	93.81	375.23	1407.10
36											208.13	416.27	208.13			416.27	1248.80
37												22.48	67.43	22.48	44.95	22.48	179.80
38											119.40					59.70	179.10
39																	
40																104.20	104.20
41																112.10	112.10
42																	
Total		706	4	8	52	283	1196	2377	1656	1347	1610	2014	1467	432	738	1680	15571
%		4.54	0.02	0.05	0.34	1.82	7.68	15.26	10.63	8.65	10.34	12.94	9.42	2.77	4.74	10.79	100.00
M. weight		7.16	109.78	114.92	152.97	192.16	226.73	241.69	235.92	251.72	284.07	286.27	290.05	294.20	290.11	331.84	47.77
No fish		88980	31	64	330	1422	5092	9506	6804	5198	5480	6815	4904	1426	2474	4891	143418
%		62.04	0.02	0.04	0.23	0.99	3.55	6.63	4.74	3.62	3.82	4.75	3.42	0.99	1.73	3.41	100.00
M. length		9.74	24.25	24.62	27.09	29.24	30.90	31.57	31.32	32.00	33.32	33.41	33.55	33.71	33.56	35.10	18.36
s.d.		0.96		0.79	1.65	1.70	1.91	1.88	1.56	1.40	2.07	1.93	1.84	1.69	1.51	2.36	11.15

Table 6d: Horse mackerel assessment in VIIIc-W

BIOMASS (tonnes). ZONE: IXa-N																		
Length	AGE GROUPS															Total	No fish	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15			
5																		
6																		
7	8.00																8.00	2443
8	47.40																47.40	9947
9	206.60																206.60	31063
10	400.80																400.80	44675
11	43.10																43.10	3665
12	18.50																18.50	1222
13	23.30																23.30	1222
14																		
15																		
16																		
17																		
18																		
19																		
20																		
21																		
22																		
23																		
24																		
25																		
26																		
27																		
28																		
29				0.06	0.37	0.37	0.92	0.43		0.06		0.06	0.06	0.06			2.40	12
30					0.72	2.89	6.13	3.97	2.16	0.72	1.44	0.36					18.40	84
31					2.36	9.44	12.98	17.70	11.80	4.72	8.26	5.90	1.18	1.18	2.36	77.90	325	
32						11.33	13.59	13.59	15.86	20.39	18.12	9.06		4.53	4.53	111.00	421	
33						7.63	20.36	12.72	10.18	12.72	10.18	12.72	5.09	10.18	12.72	114.50	397	
34						4.23	21.13		12.68	8.45	16.91	16.91	8.45	12.68	8.45	109.90	349	
35							5.51	5.51		11.01	16.52	11.01	5.51	5.51	22.03	82.60	240	
36										10.47	20.93	10.47			20.93	62.80	168	
37											0.61	1.84	0.61	1.23	0.61	4.90	12	
38										7.00					3.50	10.50	24	
39																		
40																		
41																6.10	6.10	
42																6.60	6.60	
Total	748			0	3	36	81	54	53	76	93	68	21	35	88	1355	96293	
%	55.17			0.00	0.25	2.65	5.95	3.98	3.89	5.57	6.86	5.04	1.54	2.61	6.48	100.00		
M. weight	7.16			192.36	224.13	254.49	268.29	254.79	263.40	295.53	296.41	297.33	303.09	294.62	337.22	8.32		
No fish	94237			0	15	137	292	206	195	248	304	223	67	117	252	96293		
%	97.87			0.00	0.02	0.14	0.30	0.21	0.20	0.26	0.32	0.23	0.07	0.12	0.26	100.00		
M. length	9.74			29.25	30.78	32.12	32.69	32.13	32.49	33.76	33.80	33.83	34.05	33.73	35.29	10.24		
s.d.	0.96				0.73	1.17	1.48	1.31	1.19	1.94	1.77	1.62	1.21	1.20	2.35	3.56		

Table 6e: Horse mackerel assessment in IXa-N

BIOMASS (tonnes). ZONE: Spain																	
Length	AGE GROUPS															Total	No fish
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15+		
5																	
6																	
7	15.60															15.60	4750
8	92.20															92.20	19340
9	446.20															446.20	67080
10	1035.80															1035.80	115446
11	146.30															146.30	12420
12	44.10															44.10	2921
13	48.60															48.60	2547
14	4.70															4.70	198
15																	
16																	
17																	
18																	
19																	
20																	
21																	
22		141.60	106.20													247.80	2825
23		381.58	1017.54	254.38												1653.50	16546
24		531.80	886.33	1063.59	1063.59	354.53	177.27									4077.10	36016
25			217.83	871.31	3267.43	1306.97	435.66									6099.20	47801
26			209.11	418.21	627.32	2718.37	209.11									4182.10	29213
27				536.95	536.95	805.43	536.95	671.19	134.24							3221.70	20143
28					1142.60	2056.69	1599.64	685.56	685.56	457.04						6627.10	37236
29				426.97	2561.80	2561.80	6404.50	2988.77		426.97		426.97	426.97	426.97		16651.70	84390
30					801.93	3207.72	6816.40	4410.61	2405.79	801.93	1603.86	400.96				20449.20	93797
31					387.29	1549.18	2130.12	2904.70	1936.47	774.59	1355.53	968.23	193.65	193.65	387.29	12780.70	53230
32						703.14	843.77	843.77	984.40	1265.66	1125.03	562.51	281.26	281.26	6890.80	26137	
33						188.48	502.61	314.13	251.31	314.13	251.31	314.13	125.65	251.31	314.13	2827.20	9794
34						84.99	424.96		254.98	169.98	339.97	339.97	169.98	254.98	169.98	2209.80	7010
35							99.31	99.31		198.63	297.94	198.63	99.31	99.31	397.25	1489.70	4339
36										218.60	437.20	218.60			437.20	1311.60	3515
37											23.09	69.26	23.09	46.18	23.09	184.70	456
38										126.40					63.20	189.60	433
39																	
40															110.30	110.30	217
41															118.70	118.70	217
42																	
Total	1834	1055	2437	3571	10389	15537	20180	12918	6653	4754	5434	3499	1039	1554	2302	93156	698017
%	1.97	1.13	2.62	3.83	11.15	16.68	21.66	13.87	7.14	5.10	5.83	3.76	1.11	1.67	2.47	100.00	
M. weight	7.38	100.63	105.03	125.95	147.19	171.46	198.96	208.46	220.85	234.62	246.83	247.23	232.68	244.68	304.76	89.59	
No fish	224701	10130	22390	27212	67437	86693	97960	60102	29205	19518	21315	13671	4291	6120	7271	698017	
%	32.19	1.45	3.21	3.90	9.66	12.42	14.03	8.61	4.18	2.80	3.05	1.96	0.61	0.88	1.04		
M. length	9.83	23.55	23.89	25.39	26.75	28.15	29.58	30.05	30.63	31.26	31.79	31.81	31.17	31.70	34.11	22.66	
s.d.	0.94	0.73	0.94	1.60	2.08	2.20	1.71	1.34	1.46	2.12	1.73	1.96	2.26	2.14	2.54	9.17	

Table 2f: Horse mackerel assessment in Spain

Zone	Area	No	Mean	σ^2	Model	ν^*	nugget/model	Surface	Fishing St	No	Biomass
VIIIb	Francia norte	88	30.57	1343.77	500+sph(843;14)	14.71	38.60%	1018.27	P06, P08	220111012.8	3772.6
	Francia sur	42	271.74	188729.9	89000+sph(100000;6)	6404.92	33.10%	409.03	P01, P03, P04	943683205.1	11392
			Total					1427.3		1163794218	15164.6
VIIIc-Este	Abra	9	2.56	26.28	n.a.	n.a.	n.a.	91.35	P37, P42	1466955	31
			Total					91.35		1466955	31
Total Francia								1427.3		1163794218	15164.6
Total España								91.35		1466955	31
TOTAL								1519		1165261173	15196

Table 7: Input values and main results for anchovy assessment

BIOMASS (tonnes). ZONE: VIIIb										
Length	AGE GROUPS							8	Total	No fish
	1	2	3	4	5	6	7			
8										
8.5										
9										
9.5										
10	122.80								122.80	22586
10.5	180.40								180.40	28474
11	871.60								871.60	118898
11.5	946.40								946.40	112248
12	1371.60								1371.60	142271
12.5	1316.70								1316.70	120087
13	2254.20								2254.20	181648
13.5	1874.30								1874.30	134074
14	1242.90								1242.90	79257
14.5	669.40								669.40	38208
15	796.00								796.00	40807
15.5	513.78	64.22							578.00	26710
16	590.20								590.20	24669
16.5	352.85	294.05							646.90	24525
17	735.43	122.57							858.00	29592
17.5	234.60	117.30							351.90	11071
18	254.00								254.00	7307
18.5	74.10								74.10	1954
19										
19.5										
20										
20.5										
21										
21.5										
22										
22.5										
23										
Total	14401	598							14999	1144383
%	96.01	3.99							100.00	
M. weight	14.99	33.05							15.25	
No Fish	1122350	22033							1144383	1144383
%	98.07	1.93							100.00	
M. length	13.16	16.88							13.23	13.23
s.d.	1.63	0.58							1.69	1.69

Table 8aa: Anchovy assessment in VIIIb (France). (Numbers in thousands, biomass in tonnes)

BIOMASS (tonnes). ZONE: VIIIc-Ee (3°20'W-1°30'W)

Length	AGE GROUPS								Total	No fish
	1	2	3	4	5	6	7	8		
8										
8.5										
9										
9.5										
10										
10.5										
11										
11.5										
12	0.40								0.40	33
12.5	1.00								1.00	81
13	1.60								1.60	117
13.5	1.20								1.20	79
14	3.10								3.10	184
14.5	3.40								3.40	178
15	4.00								4.00	190
15.5	4.82	0.48							5.30	225
16	4.89	0.41							5.30	206
16.5	0.64	0.46							1.10	37
17	0.77	0.13							0.90	30
17.5	1.27	0.63							1.90	56
18	1.00								1.00	26
18.5	1.10								1.10	26
19										
19.5										
20										
20.5										
21										
21.5										
22										
22.5										
23										
Total	29	2							31	1467
%	93.26	6.74							100.00	
M. weight	25.13	34.05							25.54	
No Fish	1392	75							1467	1467
%	94.92	5.08							100.00	
M. length	15.04	16.65							15.13	15.13
s.d.	1.42	0.77							1.44	1.44

Table 8b: Sardine assessment in VIIIc E (Spain)